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BY

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ACCIDENT COST AND MINE SAFETY[1]

By E. H. Denny[2]

The coal and metal mines of the United States furnish this country with a large part of the fuel and material necessary to support our industries and thus make possible the welfare and prosperity of our people and even the continuance of our present-day scale of civilization. Mining companies furnish material to industry with one general purpose in mind — the making of a profit on their work. Efforts are being made successfully and continually to reduce operating costs, to increase production per man, and to perform work as far as possible mechanically and with more efficiency. These efforts are made primarily to reduce costs, to increase production, or to do both - in other words to make more profits or more certain profits.

In the endeavor to reduce expense companies are considering more and more the factors which enter into costs of production, among them the factor of accidents and their cost. This paper endeavors to estimate the approximate cost of accidents to the mining industry in order to present the saving possible through accident reduction or elimination.

It is generally felt that, if only from a humanitarian standpoint, interest and work toward safety is amply justified. The mine officials and miners who produce the fuel and metal necessary to the conducting of industry and the well being and comfort of our people are surely entitled to all the safeguards which experience and science can suggest. The earnest and continued effort and study of State and National Governments, of mine officials' organizations, of miners' organizations, and of individual mining companies and miners are needed to reduce the accident rate in what comparative accident figures clearly show is a hazardous industry. A large part of the continued work necessary to reduce mining accidents must come from the mining companies themselves, and consideration of accident costs should prove an added incentive to them toward safety efforts. Let us consider roughly what accidents in and about coal and metal mines cost in dollars and cents.

In 1926 (the last year for which complete figures have been published) the coal mines of the United States produced 657,804,437 tons of bituminous coal and anthracite, and employed 759,033 men. In that year 2,518 men were killed by accidents in and about coal mines. The U. S. Bureau of Mines does not get complete figures on nonfatal accidents in coal mines, but figures gathered for a four-year period from certain mines which were competing in the National Safety Competition conducted by the Bureau of Mines indicate that roughly about 71 nonfatal accidents involving loss of time of one or more working days occur to every one fatal accident. It can be estimated, therefore, that in 1926 there were about 181,300 accidents in coal mines involving loss of time, including fatalities.

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[1] - The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular No. 6166"

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The average number of days lost per accident, including fatal accidents and permanent total disability cases, figured at 6,000 days lost time each and again using an average from this safety contest, is about 117 days; 181,300 accidents at 117 days lost time per accident gives a total of 21,212,100 days lost due to coal-mine accidents. On a wage basis of $5 per day this would mean an annual loss to the coal miners in wages of $106,060, 500. In industry generally, according to the National Safety Council, over 50 per cent of the lost-time injuries are of such short duration that no compensation is paid to injured men; in the case of a fatality the amount paid to heirs of the deceased amounts usually to only a small fraction of the 6,000 days wage loss, an average figure generally used in figuring lost time from fatal accidents. The National Safety Council, therefore, estimates that the total compensation paid in case of all accidents averages about one-ninth of the wages lost. On this basis the coal miners of the country annually lose about $94,000,000 in direct wage loss due to accident, or about $124 per man employed. This average includes the cost of fatal accidents and permanent disabilities, but even if the cost of fatal accidents is deducted the average cost to the individual miner annually for nonfatal accidents is about $36. The loss to the coal-mine operator through accidents is estimated to be at least that of the employee, but is not so easy to figure directly. In one way or another he pays the compensation to the miner either directly or through an insurance company. He pays for interruptions of production due to accident, for replacement of workmen and for breaking in new men, for damage or destruction of property, for disturbed industrial relations likely to result from accidents for reduced morale and efficiency of employees, for medical and hospital care, for court costs of settling disputed oased and probably for other items. It is likely, therefore, that the total loss financially to employer and employee in the coal mining industry in 1926 through accident occurrence amounted to about $188,000,000. On an output of 658,000,000 tons $94,000,000 loss to the operator amounts to about 14 cents in cost per ton of coal mined or an important part of production cost in many instances representing the difference between profit and loss.

Metal mine costs due to accident may be similarly figured. The United States Bureau of Mines obtains accurate figures on the number of lost-time nonfatal accidents as well as fatal accidents in the metal-mining industry. In 1926 the metal mines employed 127,823 men; 430 men were killed and 30,350 men received lost-time but nonfatal injuries as a result of accidents. There was an average of 114 days lost time[3] for each of these fatal and nonfatal injuries, again computing a fatality as 6,000 days lost time. This is equivalent to 3,523,944 days time lost due to accident, or at $5 per day per man, to a wage loss of $17,619,720. Again deducting one-ninth of this figure for compensation paid, the metal miner loses in wages annually about $15,700,000, or about $122 per individual.

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[3] Adams, W. W., Metal-Mine Accidents in the United States, 1926. Bull. 292, Bureau of Mines, 1928; p. 65.

This average loss per individual includes the cost of fatal accidents reckoned at 6000 days or $30,000, but even if the loss in time due to fatal accidents be deducted, the average cost to each individual metal miner each year for nonfatal accidents is about $32.

Estimating the loss to the metal-mine employer as about the same as that to the employee, the annual cost of metal-mine accidents to the employer is about $15,700,000 and to employer and miner is $31,400,000.

The above figures show that accidents represent a large annual financial loss to mining companies and to miners. Some considerable portion of this loss is also borne by the consuming public. State, company, Federal, and miners' organizations have conducted much work toward accident prevention. What have been the results? Generally speaking it may be said that some individual companies both large and small have achieved a remarkable accident reduction. Metal-mine accidents have decreased to some extent. Coal-mine accidents, if anything, have shown a recent tendency to increase.

The following tables give average fatality rates for the coal and metal mines of the United States as calculated by the U. S. Bureau of Mines.[4]

Average fatality rates at coal mines of the United States*

PERIOD	MEN KILLED PER THOUSAND 300-DAY WORKERS	AVERAGE COAL PRODUCTION PER MAN-TONS PER DAY	DEATHS PER MILLION TONS
1906 - 1910	5.49	3.10	5.89
1911 - 1915	4.65	3.26	4.76
1916 - 1920	4.03	3.48	3.86
1920 - 1925	4.58	3.85	3.96
1926	4.50	3.92	3.83
1927	-	-	3.70

* Total coal miners killed by accident, 1906-1927, inclusive - 53,787.

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[4] Ref. cited, page 2.

[4] Adams, W. W., Coal-Mine Fatalities in the U. S.: 1927. Bull. 293, Bureau of Mines, page 3

Average fatality rates at metal mines of the United States *
(Includes nonmetallic minerals other than coal)

PERIOD	MEN KILLED PER THOUSAND 300-DAY WORKERS
1911-1915	4.01
1916-1920	3.70
1921-1925	3.23
1926	3.47

* Total metal miners killed by accident, 1911-1926 inclusive, - 8,399.

The fatality rate in coal mines per million tons of coal production (3.96) in the period 1921-1925 had decreased about 33 per cent as compared with the period 1906-1910 (5.89) and showed further slight decreases in 1926 (3.83) and in 1927 (3.70). This decrease has been coincident with an increased production per man of almost one-third. However, any accident figures based on tonnage production have little or no relation to the question as to whether mining is becoming more or less hazardous; more efficient mining methods and devices have increased the tonnage output per man and therefore a lessened accident rate would be expected even though the accident rate on a time-exposure basis remained approximately unchanged. The tabulated figures of fatal accidents based on men killed per thousand, 300-day workers, a method of calculation based on a time-exposure or frequency basis, show that the apparent large accident reduction on a tonnage basis is not a real one. The fatal accident rate for 1926 (4.50) based on men killed per thousand 300-day workers is indeed lower than that of the period 1906-1910, but there has been little change during the period 1911 - 1926, the fatality rate during the years 1921-1926 being definitely higher than that from 1916 to 1920.

The fatality rate based on men killed per thousand 300-day workers in metal mines showed a general decrease during the period 1911 to 1925. The increase in 1926 is due to one mine inundation which resulted in the deaths of 51 men. In recent years many of the larger mines have expended much time and money designed to improve ventilation and haulage and thus gain more efficiency and safety.

On first thought the accident figures presented above might make one skeptical as to whether safety efforts have been worth while, particularly in coal mining. However, no one can say how many more fatalities might have occurred had not there been accident-prevention work attempted. Effort has been successfully made to increase production per man, mines have gone deeper with increasingly difficult ventilation, roof control, and haulage